

REMARKS

Upon entry of the amendments, claims 1-25 constitute the pending claims in the present application. New claims 8-25 have been added to further clarify the subject matter claimed. Support for these claims can be found throughout the specification, including the figures.

For example, claim 8 is supported at least by page 4, first paragraph, and by Figures 4-12; claims 9 and 12 are supported at least by the paragraph bridging pages 5-6, and by Figures 4-12; claim 10 is supported at least by page 2, line 11; claim 11 is supported at least by page 2, line 13; claim 13 is supported at least by page 2, lines 13-14; claim 14 is supported at least by page 2, lines 16-17; claim 15 is supported at least by page 4, line 22; claim 16 is supported at least by page 5, line 15; claims 17 and 18 are supported at least by the paragraph bridging pages 5-6; claim 19 is supported at least by page 6, first full paragraph; claim 20 is supported at least by page 6, first full paragraph and Figure 4C; claim 21 is supported at least by page 9, lines 20-21; claim 22 is supported at least by page 9, line 18; claim 23 is supported at least by page 9, last paragraph; and claims 24 and 25 are supported at least by page 10, second full paragraph.

Applicants also submit formal drawings herewith.

Applicants respectfully request reconsideration in view of the following remarks. Issues raised by the Examiner will be addressed below in the order they appear in the Office Action.

Rejection of Claims 1-3 and 7 under 35 USC §103(a) in view of Horwitz et al.

Claims 1-3 and 7 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Horwitz *et al.* (U.S. Pat. No. 5,371,822; Reference B).

The Examiner alleges that Horwitz discloses an optical device comprising a plurality of channels and plurality of fibers inserted in the plurality of channels, and a plurality of optical components aligned and connected with the plurality of fibers. The Examiner states that the guiding means for the optic fiber in the claimed invention is in needle form. The Examiner appears to have taken the position that the ordinarily skilled artisan would recognize from the disclosure of Horwitz any guiding means or fiber holder, including needles, with the intent of attaining high accuracy in aligning the optical beam with its intended target (such as a detector). Applicants respectfully disagree.

Claim 1 recites an optical device comprising a plurality of needles having channels and a plurality of fibers inserted in the plurality of needles. Horwitz appears to disclose a method of

constructing opto-electronic integrated circuit packages by passively aligning optical fibers inserted through holes in a package lid which are arranged in a pattern which corresponds with the pattern of emitters and receivers on a circuit die (see Abstract). There is simply no teaching or suggestion in Horwitz of needles as an alternative to the package lid with holes. Although the Examiner appears to assert that this alternative would have been readily recognized by the ordinarily skilled artisan, the Examiner has not provided any evidence of this assertion. Accordingly, Applicant believes that the Examiner has not presented a *prima facie* showing of obviousness.

Moreover, Applicant believes that, in fact, the ordinarily skilled artisan would not have recognized the claimed optical device as an alternative to that disclosed by Horwitz. Horwitz describes in Col. 7-8 that it is critical to align the fiber 30, the hole 16a, and the emitters / receivers 28, by carefully calculating and designing the dimensions of the emitter 28a (10 microns), fiber 30a (95.6 microns), waveguide taps 43 (98 microns), fiber 30b (100.4 microns), and receiver 28b (128 microns) (see Figure 7), such that the systematic misalignments arising during the manufacture of the device can be tolerated / compensated. In other words, Horwitz does not teach a method which *actively avoids* alignment errors, but teaches a method which *passively compensates* for the maximum systematic errors of manufacture, such that “even if every aspect of the system performs at its worst, the fibers, emitters and receivers will align to transmit and receive approximately 100% of the optical signal energy.” (see column 8, lines 48-51 of Horwitz).

In contrast, the claimed device takes advantage of the preformed channels in needle to *actively* guide the fiber to its target (emitter / detector, see below). The hole 16a of Horwitz obviously is not such a channel with such a guiding and positioning function as the needle of the claimed device has. In fact, Horwitz explicitly teaches in TABLE 1 (bridging columns 7 and 8) that “hole location in lid,” “hole shape,” “hold drift,” and “hole entry oversizing” comprise a maximum system alignment error of 9.2 microns ($0.2 + 1 + 5 + 3 = 9.2$), or about 67% of the maximum cumulative error of 13.8 microns.

The claimed invention takes advantage of the fact that the needles are fabricated using photolithography and/or laser drilling, both of which can achieve very accurate placement of the needles. Alignment to tolerances of approximately a micron can be achieved. (page 2, lines 12-13). In addition, the fibers can be fixed in place using epoxy that is thermally or UV cured (or

done in combination), and the z-orientation can be determined by fixturing the needles so that the fibers, when inserted, come in contact with a stop. (page 2, lines 13-16). These features help to further increase the accuracy of three dimensional fiber placement, to a degree that is far superior to what is disclosed in Horwitz.

In addition, Applicant believes that the unexpected functional benefits of the optical device and method for forming same rebut any *prima facie* showing of obviousness which might be alleged based on the cited art. For instance, page 5, first full paragraph describes several improvements of certain embodiments of the claimed invention over the prior art. These improvements include micrometer alignments in all three dimensions for a large number of fibers, the ease of inserting the fibers, and additional strength.

Accordingly, Applicant believes that the claimed invention is not obvious in view of the cited art. Reconsideration and withdrawal of the rejection are respectfully requested.

Rejection of Claims 4-6 under 35 USC §103(a) in view of Horwitz et al. over Trezza

Claims 4-6 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Horwitz et al. (U.S. Pat. No. 5,371,822) in view of Trezza (U.S. Pat. No. 6,447,174).

The Office Action asserts that it is within the knowledge of one skilled in the art to recognize there are photodetectors within the VCSEL, in order to receive the signal from the laser fiber. While not accepting the merits of the Examiner's argument, Applicants submit that these claims depend on claim 1, and the defects of Horwitz described above are not overcome even in combination with the teachings of Horwitz.

Trezza appears to disclose an active optical interconnect, with portions showing a fiber optic bundle 12 as a two-dimensional array 13 of optical fibers, which array may be complementary to an array 18 of emitters and/or detectors (column 3, lines 11-13). There is no teaching or suggestion in Trezza of needles in which a plurality of fibers are inserted.

The Examiner also asserts that "[i]t would have been obvious to one of ordinary skill in the art to provide Suzuki '976 with the photodetectors as taught or suggested by Trezza '174, for the benefit of detect, measure, or transmitting the incoming signal." It is unclear what the "Suzuki '976" reference cited in this sentence is, and there is no discussion by the Examiner

about the relevance of said Suzuki '976. Clarification is respectfully requested.

Assuming *arguendo* (without agreeing) that said Suzuki '976 is U.S. Pat. No. 5,362,976 issued to Katsuhiko Suzuki (as appearing in PTO Form 892), and, as the Examiner suggests, that the overall design of Suzuki and the photodetectors of Trezza can be validly combined, Applicant submits that the combined teaching still does not teach or suggest any needle or needle array, nor any of the more specific features associated with the needles as described above. The substrate 1 of Suzuki merely contains several "through holes 3," much like the holes 16a in Horwitz, and thus in no way teaches or suggests any needles with channels.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. 103(a).

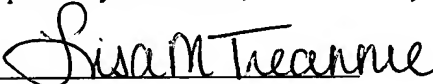
CONCLUSION

For the foregoing reasons, Applicants respectfully request reconsideration and withdrawal of the pending rejections. Applicants believe that the claims are now in condition for allowance and early notification to this effect is earnestly solicited. Any questions arising from this submission may be directed to the undersigned at (617) 951-7000.

If there are any other fees due in connection with the filing of this submission, please charge the fees to our **Deposit Account No. 18-1945**. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit account.

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Respectfully submitted,

By 
Lisa M. Treannie

Registration No.: 41,368
ROPES & GRAY LLP
One International Place
Boston, Massachusetts 02110-2624
(617) 951-7000
(617) 951-7050 (Fax)
Attorneys For Applicant